

**Process and Controls Review**  
**For**  
**Capital Asset Recording of New Hard-wired Central Office Equipment**

Prepared by

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Submitted to

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At Bell Atlantic's request, PricewaterhouseCoopers has conducted a review of Bell Atlantic's processes and controls involved in the recording of hard-wired Central Office Equipment (COE) to the fixed asset general ledger for Bell Atlantic-North and Bell Atlantic-South operating territories. Our objective was to identify the current processes for capital asset recording of new COE, ascertain whether these processes were dependent on the information contained in the continuing property records, and perform a limited review of the associated process controls.

Our review included the activities involved in procuring, installing, and recording COE hard-wired investment and was organized into the following process areas:

- 1) Engineering estimate approval and set-up
- 2) Telephone Equipment Orders (TEO) generation, approval and issuance
- 3) Material receipt
- 4) Equipment installation
- 5) Vendor payment authorization
- 6) Material and labor cost recording
- 7) Recording of in-place cost to the fixed asset ledger
- 8) Vendor credits.

In summary, the process under study begins with the preparation and authorization of engineering estimates for COE installation. Once the estimate is approved and set-up, one or more telephone equipment orders are issued against the estimate. The TEO serves as a purchase order for vendors providing materials and/or labor. Upon receiving the procured materials and/or labor various activities are performed to verify that the order was fulfilled. At some time during or after the delivery of materials or labor the vendor will issue an invoice which in turn triggers activities related to processing of payments and credits. During and after the installation work, costs associated with the work are tracked and eventually recorded in the General Ledger.<sup>1</sup>

The information on which we have based our review was obtained largely through detailed interviews with approximately twenty-four representatives of Bell Atlantic presently in supervisory or managerial positions with responsibilities for various aspects of the processes under review. In our interviews, we were informed about the current operations of Bell Atlantic-North and Bell Atlantic-South. We also reviewed documentation which supplemented and supported aspects of information obtained via our interviews.

### **Findings**

The recording of assets to the General Ledger is an accounting process that does not rely on results or tracking of equipment in the continuing property records. Unlike the continuing property records, which are maintained in the individual central office by the engineering staff (and through direct inputs by vendors), the general ledger is centrally maintained by Bell Atlantic's corporate finance department, and includes controls that are independent from the continuing property records.

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<sup>1</sup> A brief description of each activity is provided in Appendix A of this report.

In recording additions to the general ledger, the process of COE asset additions begins with the creation of an engineering estimate and associated Telephone Equipment Orders (TEO). The TEO serves as a purchase order to vendors and a specification of work for construction of COE. Shortly after being created, the TEO is recorded in the Bill Verification Authorization Payment Process (BVAPP) system, the Detailed Continuing Property Record (DCPR) system, the Standard Financial System (SFS) for South and the Disk Operated Property and Cost System (DOPAC) for North.

In response to the TEO, vendors will deliver the materials and/or labor and issue an invoice to Bell Atlantic. At this point, vendor invoices are reviewed by Bell Atlantic and processed through the Accounts Payable system for payment. Vendor payments and Bell Atlantic labor costs are recorded in the actual cost records contained in the main financial system (South - SFS; North - DOPAC).

This flow of asset addition information occurs without passing through the Detailed Continuing Property Record (DCPR) system. Upon a “turn up” into service of the equipment associated with the investment, the status of the assets recorded in SFS (South) and DOPAC (North) are changed by a human operator from “work in progress (2003)” to “in service (2001)”. As a result of this step, the “turned up” assets are recorded as additions to the fixed asset ledger. Independent of the asset addition activities, the asset will be “turned up” in DCPR for the purpose of maintaining detailed engineering records of the asset during its in-service life and its retirement.

Based on this review, it appears that the eight processes noted above for additions to the general ledger are currently being performed. Further, during the course of our review nothing came to our attention that would indicate that there are material deficiencies in the eight process areas. Controls for the eight process areas of Bell Atlantic-North and Bell Atlantic-South operating territories observed by PricewaterhouseCoopers in this review are listed in Exhibits 1 and 2 (attached), respectively.

**Exhibit 1. Observed Controls – Bell Atlantic-North**

<b>Process Step</b>	<b>Control</b>
<b>Engineering estimate approval and setup</b>	<ul style="list-style-type: none"> <li>- Capital Management authorization is required</li> <li>- Engineering authorization is required</li> <li>- Systems are used to record the estimate setup process</li> <li>- Engineering manager performs approval on-line for estimates greater than or equal to \$100,000, except in areas of New York where approvals are done off-line; for estimates under \$100,000, the engineering manager is not required to approve</li> </ul>
<b>TEO generation, approval and issuance</b>	<ul style="list-style-type: none"> <li>- System edits are performed for user authority, location, FRC and ECN (Estimate Case Number)</li> <li>- OSEPOC / Lotus Notes will not allow an engineer to submit a TEO until the corresponding estimate case is approved</li> <li>- For all TEOs, regardless of dollar amount, the requesting engineer is required to obtain approval by an engineering manager;</li> <li>- System (OSEPOC in New England; OSEPOC or Lotus Notes in New York) does not enforce approval</li> <li>- The approved TEO is manually rekeyed into purchasing system (Expressway)</li> </ul>
<b>Materials receipt</b>	<ul style="list-style-type: none"> <li>- In New England, shipments are sent to any of seven public warehouses operated by third parties under contract to Bell Atlantic; Upon receipt, the shipment weight and the TEO # cited on the bill of lading are recorded</li> <li>- In New England, contractors are not used for COE hard-wired installation work and therefore are not involved in material receipting</li> <li>- In New York, EF&amp;I (Engineer, Furnish, and Install) jobs are outsourced to contractors that will perform material receipting, warehousing and freight forwarding as required by the job</li> <li>- In New York, for F (Furnish) orders, equipment will be drop shipped to the installation site (CO); Upon receipt, the CO Technician will, at his/her discretion, record the receipt and notify the requesting CO engineer; Prior to the start of installation work, the CO engineer will inspect the shipment for quantity, condition, and order accuracy.</li> </ul>
<b>Equipment Installation</b>	<ul style="list-style-type: none"> <li>- In New York, before starting installation work, the vendor prepares a Methods of Procedures (MOP) document and submits it to Bell Atlantic, either in a meeting or via fax or mail; The MOP must be approved by the CO team leader and operations foreman and various subject matter experts if deemed appropriate by the CO engineer; Some time after the job is completed, the vendor will prepare and submit to Bell Atlantic a Completion Notice.</li> <li>- In New York, when installation work is performed by Bell Atlantic personnel, a formal Completion Notice is not generated; instead, job status sheets received monthly from Accounting or the Asset Management Group are reviewed and updated</li> <li>- In New England, a MOP is generated by the Equipment</li> </ul>

Process Step	Control
	<p>Installation work force which must be approved by Network Operations Center before beginning the installation work; Upon job completion, job records are manually entered into a job tracking database from which electronic (email) notification is sent to the DCPR group and Accounting. (note: vendors are not used for COE installation work in New England)</p>
<b>Vendor payment authorization</b>	<ul style="list-style-type: none"> <li>- DCPR group clerk manually compares invoice amount against the contract limit for the TEO to make sure that the invoice amount does not exceed the contract limits. BVAPP system also checks that limits are not exceeded; Invoice is allowed to exceed TEO contract limits by no more than the lesser of 10% of total TEO amount or \$250.</li> <li>- Payment is authorized by the DCPR group clerk unless the requesting engineer indicates that payment should not be made as invoiced; In New York, payment authorization is deferred for fourteen days during which time the requesting engineer may approve or dispute the invoice; if the engineer does not respond to the DCPR group in the fourteen day period, payment is then authorized</li> <li>- The Mechanized Accounts Payable System (MAPS) checks for validity and consistency of estimate authorization number, FRC and geocode.</li> </ul>
<b>Material and labor cost recording</b>	<ul style="list-style-type: none"> <li>- Time recording: <ul style="list-style-type: none"> <li>- Reporting employee's superior (job foreman for EI technicians and other field personnel; District project manager or engineering manager for engineers) approves time report either on-line or on paper time report</li> <li>- Common Time and Labor Reporting (CTLR) system checks for validity and consistency of all key fields entered (employee ID, FRC, location codes, and reporting dates)</li> <li>- Non-productive time is classified by the CTLR system as expense</li> </ul> </li> <li>- Labor hours records are mechanically transferred from CTLR to FISA where the data is checked for validity and consistency; From FISA, the records are mechanically fed to DOPAC and then on to the Standard Rating System where hours are rated and grouped by capital and expense.</li> <li>- Manual journal entries are made to allocate a portion of non-productive time to capital accounts; Amount of labor cost moved to capital accounts is based on reporting patterns of the employee's work group</li> <li>- Standard labor rates are created annually, and take into account the budgets and initiatives for each department</li> <li>- Data processing reports run for each load from DOPAC: <ul style="list-style-type: none"> <li>▪ Daily Preevaluated Report</li> <li>▪ Daily Processing Rate Control Report</li> <li>▪ Rate Exception Report</li> <li>▪ Six Validation Table Reports</li> </ul> </li> </ul>
<b>Recording of in-place</b>	<ul style="list-style-type: none"> <li>- <u>Monthly Reconciliations:</u></li> </ul>

<b>Process Step</b>	<b>Control</b>
<b>cost to the fixed asset ledger</b>	<ul style="list-style-type: none"> <li>▪ Compare balances of G/L and DMS (New England) or CPRIS (New York) monthly; Balances must be equal at the account/sub-account levels; Discrepancies must be resolved by accounting group.</li> <li>▪ DOPAC preliminary statement and manual journal entries (on day 4 of 7 day close cycle) are compared to trial balance of G/L. Discrepancies are identified and resolved.</li> <li>▪ Change in activity for accounts and sub-accounts are inspected visually for purchases, retirements, and transfers. Significant anomalous entries are investigated by the accounting department.</li> <li>▪ Manual Journal Entries are applied monthly by Corporate Books directly into the General Ledger. <ul style="list-style-type: none"> <li>▪ Organization unit of journal entry author is recorded in DOPAC as well as a journal entry batch number.</li> <li>▪ Corporate Books group is responsible for accuracy of all manual journal entries.</li> <li>▪ Manual Journal entries affecting the asset ledger will flow through DOPAC to DMS without transaction detail (New England) and CPRIS with transaction detail (New York) in the usual manner thereby keeping DMS/CPRIS in balance with the G/L.</li> </ul> </li> </ul> <p>- <u>Annual Reconciliations:</u></p> <ul style="list-style-type: none"> <li>- Compare balances of G/L and DCPR annually by engineering; Balances at the account/sub-account level must be equal; Discrepancies are resolved by the accounting group. Bell Atlantic labor charges associated with the COE assets are loaded into DCPR at year end.</li> <li>- Manual edits may be made to DCPR system data post turn-up</li> </ul>
<b>Vendor Credits</b>	<ul style="list-style-type: none"> <li>- BVAPP system checks that the TEO is valid and that credit amount does not exceed contract limits</li> <li>- BVAPP system prevents credit from being applied if invoice for the corresponding TEO has not been paid</li> <li>- BVAPP system does not check that amount entered is less than (understates) the actual credit amount</li> </ul>

**Exhibit 2. Observed Controls – Bell Atlantic-South**

<b>Process Step</b>	<b>Control</b>
<b>Engineering estimate approval and setup</b>	<ul style="list-style-type: none"> <li>- Capital Management authorization is required</li> <li>- Engineering authorization is required</li> <li>- System used to track authorization process</li> <li>- Authorizing personnel perform approvals on-line</li> <li>- Only approved cases are accepted in the systems</li> </ul>
<b>TEO generation, approval and issuance</b>	<ul style="list-style-type: none"> <li>- System edits for authority, location, FRC and ECN (Estimate Case Number)</li> <li>- BARETS will not allow an engineer to submit a TEO until the corresponding estimate case is approved</li> </ul>

<b>Process Step</b>	<b>Control</b>
	<ul style="list-style-type: none"> <li>- TEO approvals: (1) above \$25,000: must be approved by an engineering manager, (2) less than or equal to \$25,000: requesting engineer can approve without concurrence by an engineering manager</li> <li>- Engineering manager approval is performed on-line</li> </ul>
<b>Materials receipt</b>	<ul style="list-style-type: none"> <li>- When a shipment is received at the CO, at his/her discretion the CO technician checks the shipment for quantity, condition, and order accuracy</li> <li>- Maintenance of a receipt log (at CO) is not standard operating procedure</li> <li>- Note: receipting at Bell Atlantic-South warehouses was not reviewed</li> </ul>
<b>Equipment Installation</b>	<ul style="list-style-type: none"> <li>- Before starting installation work, a meeting is held to review and approve the Methods of Procedures (MOP) document; MOP must be approved by vendor manager, Operations and appropriate Subject Matter Experts (SMEs)</li> <li>- CO technician must perform an end-of-job walkthrough and complete an end-of-job checklist document which is forwarded to the vendor manager</li> <li>- Vendor manager waits for the end-of-job checklist before "turning up" the job</li> </ul>
<b>Vendor payment authorization</b>	<ul style="list-style-type: none"> <li>- When manually entering invoice information, the BVAPP system checks invoice amount against the contract limit for the TEO to make sure that the invoice amount does not exceed the contract limits</li> <li>- When vendor invoice is received via electronic data interchange (EDI), the BVAPP system checks that (1) the TEO is valid, (2) invoice amount does not exceed contract limits, and (3) that the TEO has not already been paid</li> <li>- For "Furnish only" TEOs: <ul style="list-style-type: none"> <li>- Requesting engineer must omit/hold contract limits from record entered into BARETS. Payment is blocked by the BVAPP system until the requesting engineer "releases" the contract limits in the system; BARETS system allows only the requesting engineer to release contract limits; requesting engineer could fail to omit/hold contract limits on original TEO</li> <li>- System compares invoice amount against the contract limit in BVAPP</li> <li>- If subsequent installation is required, vendor manager will track the progress of the TEO, including material receipt</li> </ul> </li> <li>- For Engineer, Furnish &amp; Install (EF&amp;I) TEOs: <ul style="list-style-type: none"> <li>- A vendor manager is assigned responsibility for each installation job, including verification of receipt of work and materials</li> <li>- Monthly meeting is held with all vendors, vendor managers and SMEs</li> <li>- Equipment is booked as a depreciable asset only when project is completed and "turned up"</li> </ul> </li> </ul>
<b>Material and labor cost</b>	<ul style="list-style-type: none"> <li>- Time recording:</li> </ul>

<b>Process Step</b>	<b>Control</b>
<b>recording</b>	<ul style="list-style-type: none"> <li>- Reporting employee's superior approves time report</li> <li>- MTR (Mechanized Time Reporting) system checks for valid employee ID, time reporting (MTR) codes, location codes, and dates (i.e., date of report falls within current week)</li> <li>- Supplemental system checks at point of entry in to mechanized systems such as WFA (Work Force Administrator)</li> <li>- For labor cost processing, generate and review the following reports: (1) Rate reports, monthly, to verify loaded labor rates, (2) monthly variance of booked versus budget, (3) Fallout report, weekly/monthly, showing time reports that are erred, (4) Synchronization report, to reconcile overall loaded labor rates to the underlying components, e.g., disability, (5) Status of processing</li> </ul>
<b>Recording of in-place cost to the fixed asset ledger</b>	<ul style="list-style-type: none"> <li>- High-level review and reconciliation of corporate books: <ul style="list-style-type: none"> <li>- Fluctuation analysis done monthly: Shows increase/decrease from prior month and December of prior year at the account or sub-account levels. Analyst performs visual inspection of variances and comparison to trends; All variances that are deemed to be material are accounted for and documented in the Fluctuation analysis report.</li> <li>- PP&amp;E and income statement are reconciled at a high level</li> </ul> </li> <li>- Actual Cost System processing: <ul style="list-style-type: none"> <li>- Monthly, reconcile Actual Cost System to GL at the FRC and location code levels.</li> <li>- Following each monthly close, qualitatively inspect balances (final) and balance variances at the FRC level looking for anomalies in the data</li> <li>- Monthly, manually verify that all expected files fed from DCPR to Actual Cost System are received</li> <li>- Control reports are run to verify file sizes or record counts on feeder file versus file loaded into Actual Cost system</li> </ul> </li> <li>- Manual edits may be made to DCPR system data post turn-up</li> </ul>
<b>Vendor Credits</b>	<ul style="list-style-type: none"> <li>- BVAPP system checks that the TEO is valid and that credit amount does not exceed contract limits</li> <li>- BVAPP system does not check that amount entered is less than (understates) the actual credit amount</li> </ul>



## Appendix

### **Summary Description of Process Areas**

1) Engineering estimate approval and set-up

The process begins with an Engineering Request (ER) provided by the Network Planning group. The Equipment Engineer (also referred to as the Requesting Engineer) in turn establishes an engineering estimate that is reviewed and authorized by engineering management and the Capital Management group. For BA North, the estimate is created in the Oracle Streamlined Equipment Provisioning Operations Center System (OSEPOC) and once approved is sent to three systems: Detailed Continuing Property Records (DCPR), Disk Oriented Property And Costing System (DOPAC, which feeds into the General Ledger), and the Billing Verification and Authorization Payment Process (BVAPP) system. For BA South, estimates are created directly from the ER, and once approved are set up in three systems: DCPR, Standard Financial System (SFS), and BARETS which feeds BVAPP.

2) Telephone Equipment Orders (TEO) generation, approval and issuance

The Equipment Engineer creates one or more TEOs in either OSEPOC (for BA North), or the BARETS system (for BA South) for each estimate. Depending on the dollar value of the TEO, different approvals will be required. Once approved, the TEO is sent to the vendor as a purchase order with instructions and specifications necessary for the vendor to fulfill the order. Concurrent with this, the TEO information is forwarded to the BVAPP and DCPR systems.

3) Material receipt

For orders consisting of materials only, i.e., no engineering or installation labor, shipments are received by Bell Atlantic in one of two ways: drop shipments to the Central Office of installation, or shipment to a Bell Atlantic-operated warehouse. In the former case, shipments are received and signed for by a worker based at the CO, e.g., CO technician. The shipment is then matched against an order, i.e., TEO, inspected for damage and accuracy, and placed somewhere in the CO building. For BA North, record of an asset arriving at a warehouse is tracked by the Engineering Installation Operations Control Center (EIOC), and checked for content at time of shipment to installation site. For BA South, the procedures for receiving shipments at warehouses was not covered in this review.

4) Equipment installation

The installation work in BA North – New York, and in BA South, is initiated via a “MOP” (Methods of Procedures) meeting whereby the installing vendor meets with or sends the information to (via fax and phone correspondence) Bell Atlantic workers (vendor manager, operations, and various subject matter experts). The meeting/correspondence will result in agreement on work steps, logistics and so on. During the installation work, progress meetings will be held. At job completion, the vendor notifies Bell Atlantic, and in BA South requests a job walkthrough. The end-of-job walkthrough serves as an inspection of work performed. If satisfactory, CO operations will sign off on the work (in BA North – New York, no end-of-job walkthrough is performed). The vendor manager or CO engineer must then receive job completion notice from the vendor and subsequently perform another verification that the work was performed as agreed (this is the primary verification for BA North – New York). If found satisfactory, the vendor manager or CO engineer will sign off on the job and close out the TEO. At some point after the sign-off, the CO operations personnel will perform some form of acceptance testing.

Installations in BA North – New England are performed by Equipment Installation (EI) technicians. The EI technicians will create a MOP, which is approved by the Network

## Appendix

### **Summary Description of Process Areas**

Operations Center before installation work begins. Once the installation is complete, an EIOC manager is notified and must provide approval. Area Operations Managers are then notified electronically of the job completion, and provide final approval for the installation.

5) Vendor payment authorization

Vendors will send invoices to Bell Atlantic in one of two ways: via electronic data interchange (EDI) or hardcopy through mail or other courier. In the former case, the invoice will be automatically entered into the BVAPP system; whereas, the latter case will require manual entry into the BVAPP system. The DCPR group will then oversee the review and verification of the invoice. In particular, the following will be checked: (1) TEO cited on invoice matches a valid Bell Atlantic TEO, (2) for the cited TEO, contract limits exist in the BVAPP system, (3) contract limits are not exceeded by the dollar amount on the invoice. If contract limits are absent from the BVAPP record, the DCPR group will contact the requesting engineer to trigger verification that the equipment has been received as promised. Once verified, the order will be authorized for payment. When contract limits are present in the BVAPP record, and the two other criteria are satisfied, the payment will be authorized by the DCPR group. In BA North – New York, requesting engineers and field engineers are also notified of invoice receipt, and have 14 days to respond before payments are authorized. Payments are processed through the Accounts Payable system.

6) Material and labor cost recording

Labor associated with a particular CO installation job is recorded weekly via time sheet and/or manual entry in one of several mechanized operations support systems (e.g., WFA, BARS). In turn this information is forwarded to the Central Time and Labor Reporting (CTLR) system in BA North, and the Mechanized Time Reporting (MTR) system in BA South. Next in BA North, CTLR sends mechanized feeds to the Payroll system and to DOPACS (via FISA). While in DOPACS, the information is sent to the Standard Ratings System, which calculates labor cost estimates each week based on the weekly time reports and standard loaded labor rates. The costs are then returned to DOPACS for aggregation to Field Reporting Codes (FRC) before posting to the General Ledger. In BA South, MTR sends mechanized feeds to the Payroll system and the Regional Rate Development and Distribution (R2D2) system. R2D2 calculates labor cost estimates, again based on the weekly time reports and standard loaded labor rates. The weekly labor cost estimates are then fed to SFS where costs are aggregated to the FRC level and applied to the General Ledger. On a monthly basis, these estimates are adjusted to true labor costs based on actual loaded labor rates. After year end close, for both BA North and BA South, the labor costs for the entire year are passed on to the DCPR system to bring the “in place” cost in DCPR up to date with the General Ledger.

7) Recording of in-place cost to the fixed asset ledger

Upon payment to vendors through the Mechanized Accounts Payable System (MAPS), record is sent to DOPAC in BA North, and to the Standard Financial System (SFS) in BA South. If the work is designated by the requesting engineer to be “routine”, the vendor payment will be directly recorded in DOPAC(North)/SFS(South) as “in service” (designated by the status code of 2001). Whereas, if the job is not routine, it will be recorded in a work-in-progress account (designated as 2003). Upon job completion, the DCPR group will manually change the status of the job to 2001, i.e., “in service”, in both the BVAPP and DCPR systems as well as DOPAC(North)/SFS(South). Assets and associated capitalized costs will be posted to the ledger as asset additions once recorded as “2001” in DOPAC/SFS. In BA North, the account information is then updated in the General Ledger.

## Appendix

### **Summary Description of Process Areas**

8) Vendor credits.

The requesting engineer will determine whether credits from the vendor are due. In BA South, if a credit is due, it is noted in the BVAPP system where it is tracked on a recurring basis by the DCPR group. For BA North, the first point of entry into the BVAPP system is when credit invoices are received via EDI or hardcopy from the vendor. For BA South, if a credit invoice is received via EDI, the credit is directly recorded in the BVAPP system. If received via hardcopy, the DCPR group will enter the credit into the BVAPP system. For BA North, all credit invoices are manually entered into the BVAPP system. BVAPP enforces a one to one match between a credit, and previously paid TEO. If a refund check is provided, it is forwarded to Treasury for deposit. Otherwise, the amount on the credit invoice is withheld from the next payment to the vendor.

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**AFFIDAVIT OF RONALD E. WHITE, PH.D.**  
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on behalf of  
BELL ATLANTIC

August 17, 1998

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**AFFIDAVIT OF  
Ronald E. White, Ph.D.  
on behalf of  
BELL ATLANTIC**

**I. Introduction**

1. I am Executive Vice President of Foster Associates, Inc., a public utility economics consulting firm headquartered in Bethesda, Maryland. The firm's Fort Myers office, which I direct, specializes in the areas of depreciation, valuation and capital recovery. Related areas of expertise include engineering economy, intangibles, stranded investment issues and measurements of asset impairment under abandonment of FASB 71 accounting and applications of FASB 121.

2. I previously served on the faculty at Iowa State University where I earned my BS, MS, and Ph.D. degrees in engineering valuation and was honored with the Professional Achievement Citation in Engineering in 1993. I have authored numerous papers and have lectured extensively on the subject of depreciation and related fields of study. I am presently a member of the faculty of Depreciation Programs, Inc. and a founding member of the Society of Depreciation Professionals. A copy of my curriculum vitae is attached as Appendix C to this affidavit.

3. I have been asked by Bell Atlantic to formulate an independent opinion of the ratemaking implications of omitted plant retirements. More specifically, I was asked to investigate the revenue requirement and capital recovery implications of a failure to record plant retirements when plant is physically removed from service.

**II. Findings and Conclusions**

4. A common occurrence in plant accounting is the failure to record retirements in the Continuing Property Record (CPR) when plant is physically removed from service. Omitted accounting retirements can occur for a variety of reasons including: incomplete retirement work orders; plant relocations; plant transfers or reclassifications; lack of an association between physical units of property and property record descriptions contained in the CPR; and unintentional human errors. These accounting discrepancies are typically discovered in the course of conducting periodic physical inventories and plant accounting audits. Upon discovering omitted retirements,

appropriate adjusting entries are posted to the CPR to again align the plant accounting records with the physically identified plant and equipment. It should be noted that a failure to record plant retirements is not unique to telecommunications companies. Gas, electric and water utilities are equally prone to omitting plant retirements from the CPR for the reasons cited above.

5. The primary focus of this affidavit is the revenue requirement and capital recovery implications of omitted retirements under rate base/rate of return regulation. A secondary consideration is the potential for creating a bias in the initial prices adopted under a price cap form of incentive regulation.

6. The principal findings from this investigation are:

- a. Achievement of capital recovery (*i.e.*, return of and return on investor supplied capital) is not impacted by omitted retirements.
- b. It would be improper to assume that past revenue requirements were overstated as a result of omitted retirements. The amount, timing and present value of annual revenue requirements may increase, decrease or remain unchanged, depending upon the direction of movement in the composite remaining life of a plant category.
- c. It is virtually impossible to quantify the change in remaining lives for Bell Atlantic attributable to omitted retirements. It is reasonable, however, to conclude that any change in remaining lives attributable to omitted retirements would be immaterial for Bell Atlantic.

7. Based on these findings, it is my opinion that annual revenue requirements for Bell Atlantic would not have materially changed if the omitted retirements estimated in the plant accounting audit had been posted in the activity years in which the plant was physically removed from service. It follows from this conclusion that a material bias was not created in the initial prices adopted under price cap regulation. Lastly, it is my opinion that any adjustments to the CPR and plant ledger resulting from the audit should be recorded as a normal adjustment to prior period activity. The omitted retirements should not be deemed extraordinary and subject to the FCC accounting provisions for reporting extraordinary retirements.

### III. Capital Recovery Implications

8. The term *capital recovery* is used in economics to describe the periodic cash flows available for both return *of* and return *on* investor-supplied capital. The source of return on capital is net operating income and the source of return of capital is depreciation, deferred income taxes and other non-cash expenses. Full capital recovery will be achieved if, and only if, the present value of the sum of return of and return on is equal to the amount of capital originally invested. This is one of the most important and widely accepted relationships derived from the theory of interest rates. Absent this principle, the theory of financial mathematics could not be developed.

9. The opportunity for capital recovery is provided under rate base/rate of return regulation by the allowance of depreciation and other non-cash items as an operating expense and an allowance of operating income sufficient to achieve a fair rate of return on an accounting measurement of the rate base.

10. The capital recovery implications of omitted retirements can be conceptualized under rate base/rate of return regulation by noting that a plant retirement does not alter the accounting measurement of the rate base. The accounting entry for a plant retirement is a credit to the plant account and a corresponding debit to the depreciation reserve for the amount of the retirement. Both the plant account and the reserve are reduced by the same amount such that the difference between the plant account and the reserve (*i.e.*, net plant or rate base) remains unchanged by the posting of a retirement. Thus, the source of return *on* investor-supplied capital—which is the product of the rate base and the allowed rate of return—is unaffected by omitted retirements.

11. The source of return *of* capital is depreciation, deferred income taxes and other non-cash expenses. The impact of omitted retirements on this component of capital recovery is less intuitive than the impact on the rate base. The timing of depreciation expense and the size of the depreciation reserve will be changed by omitted retirements to the extent that the remaining life used in the calculation of depreciation expense is changed. Importantly, however, such a change only affects the timing of capital recovery; it does not change the present value of the sum of return *of* and return *on* the aggregate amount of capital supplied by investors. This outcome can be observed from a comparison of the capital recovery schedules contained in Appendix A to this



affidavit. Note that regardless of the remaining life used in the calculation of depreciation expense, the present value of capital recovery remains the same. It can be concluded from this analysis that achievement of capital recovery is not impacted by omitted retirements.

#### IV. Revenue Requirement Implications

12. Unlike a competitive market in which the pricing of goods and services is determined by the interaction of supply and demand, public utility regulation historically used costs or revenue requirements as the standard for rate control.<sup>1</sup> The cost of providing utility service is defined as the sum of operating expenses, depreciation expense, income taxes and a return requirement stated as the product of a fair rate of return and a rate base. The revenue requirement under regulation is given by

$$\begin{aligned}\text{Revenue Requirement} = & \text{Operating Expenses} \\ & + \text{Depreciation} \\ & + \text{Current Income Taxes} \\ & + \text{Deferred Income Taxes} \\ & + (\text{Rate Base})(\text{Allowed Rate of Return}).\end{aligned}$$

13. The above equation is known as the public utility ratemaking formula. It states that a regulated utility operating under prudent and efficient management requires revenues sufficient to cover proper operating expenses, depreciation expense and income taxes that would be payable if the authorized rate of return were earned. Additionally, the utility is entitled to earn a reasonable return on the net valuation of the property used to provide service to the public. The return requirement is calculated as the product of the net or depreciated valuation of utility property, called the *rate base*, and the allowed or authorized rate of return. If the expenses of a utility, including a reasonable return, exceed the revenue collected from providing regulated services, then the utility faces an earnings shortfall and is entitled to a rate increase. Correspondingly, if revenue exceeds expenses, including a reasonable return, then the utility is earning more than regulation has authorized and a rate decrease may be imposed.

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<sup>1</sup>Revenue requirements have played a gradually decreasing role in Bell Atlantic's price regulation. Bell Atlantic's current interstate prices are controlled by a price cap under which changes to allowable prices are not impacted by regulatory accounting costs or revenue requirements. The going-in prices, however, were based on revenue requirements which is relevant to this inquiry.

14. The query investigated in this affidavit was the potential change in revenue requirements attributable to omitted accounting retirements. Both the timing and the present value of revenue requirements were analyzed using a financial model to simulate omitted retirements.<sup>2</sup> As demonstrated by modeling various scenarios, changes in depreciation expense associated with omitted retirements are attributable to changes in the remaining life of the vintage for which retirements were not posted. The present value of revenue requirements will increase if remaining lives are lengthened. The present value of revenue requirements will decrease if remaining lives are shortened. Absent a change in remaining life, the present value of the revenue requirements will be identical for both cases. It is important, therefore, to consider the conditions under which the remaining life will change and the direction of the change when retirements are omitted.

## V. Remaining Life Implications

15. The composite remaining life of a plant category used in the calculation of depreciation expense is derived from a tabular arrangement of the age distribution of surviving plant and related statistics. The format of such a table is called a *generation arrangement*.

16. The age distribution of surviving plant is a column of numbers showing the dollar amount of investment remaining in service on a given date from each of the vintages installed in prior years. The sum of an age distribution is the total plant in service for the category. The source of data used to construct an age distribution is the CPR. The sum of an age distribution should equal the plant balance reported in the plant ledger.

17. The statistics for each vintage (*i.e.*, average life and remaining life) contained in a generation arrangement are derived from a mathematical function called a *survivor curve*. The

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<sup>2</sup>The general findings reported in this investigation were derived from a financial model in which multiple vintages of two plant accounts were systematically retired from service (and replaced to maintain service capacity) according to a specified retirement frequency distribution. The model (described in Appendix A to this affidavit) provides a complete set of financial statements (*i.e.*, Balance Sheet, Income Statement and Statement of Cash Flows) which permits experimentation with alternative assumptions regarding the posting of retirements in the CPR and the composite remaining life used in the calculation of depreciation expense. Conclusions regarding the potential impact on remaining lives for Bell Atlantic were drawn from an examination of the age distribution of omitted retirements identified in the audit relative to the age distribution of plant in service prior to a posting of the omitted retirements.

survivor curve most descriptive of the forces of retirement acting upon a plant category is identified from a statistical analysis of past retirement experience, coupled with a consideration of how these forces are likely to change in the future. The collection of past retirements used in the statistical analysis can be viewed as a random sample from an unknown parent population. The objective of a life analysis is to estimate the parameters (*i.e.*, mean service life and dispersion characteristics) of the parent population. The mean service life of the population is called a *projection life* and the survivor curve selected to describe the population forces of retirement is called a *projection curve*.

18. To the extent that the collection of retirements used in the life analysis excludes a significant number of actual retirements, it follows that both the estimated projection life and projection curve will contribute to an overstatement of the remaining life of the category. This bias can be offset, however, by the structure of the generation arrangement.<sup>3</sup>

19. It is also demonstrated in Appendix B that it is nearly impossible to predict the size and direction of a change in the remaining life of a plant category when the age distribution is adjusted for omitted retirements and the actual age of the retirements is unknown. The change will be negligible, however, if the omitted retirements are small in relation to the age distribution of surviving plant or the retirements are widely distributed over a broad range of vintages. Absent a significant change in the remaining life, revenue requirements will not be affected by omitted retirements.

## **VI. Application to Bell Atlantic**

20. The principles developed in this affidavit can be applied to the omitted retirements identified by the FCC in the Bell Atlantic plant accounting audit to address the concern that revenue requirements may have been overstated when price cap regulation was adopted.

21. First, it has been shown that revenue requirements can be overstated when the remaining life of a plant category is increased by the omission of accounting retirements. Conversely, revenue requirements can be understated when the remaining life of a plant category is decreased by the omission of accounting retirements. It is quite another matter, however, to quantify the

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<sup>3</sup>This relationship is explained in Appendix B.

change in remaining life. It was shown earlier that the age of the omitted retirements when they were physically removed from service—which is unknown to Bell Atlantic—is a critical factor in determining both the magnitude and the direction of change in the average remaining life. Absent a knowledge of when the omitted retirements were removed from service, it is virtually impossible to quantify the change in remaining life.

22. Second, any change in revenue requirements will be negligible when the change in remaining life is small. The possibility that the remaining life would change because of a misspecification of the projection life and projection curve can be dismissed for Bell Atlantic to the extent that little weight was given to statistical life studies in the represcription process. Both the projection curve and projection life were selected to conform with industry norms adopted by the FCC.

23. It is also known that the change in remaining life will be insignificant if the omitted retirements are small in relation to the age distribution of surviving plant or the retirements are widely distributed over a broad range of vintages. An examination of the size and distribution of omitted retirements by Bell Atlantic personnel confirmed that the retirements were small relative to the age distribution of surviving plant and broadly distributed over a wide range of vintages. Moreover, it is doubtful that all omitted retirements would produce changes in remaining lives in the same direction. Compensating changes would further mitigate against the potential for any large change in one direction. It is highly unlikely, therefore, that revenue requirements were misstated by Bell Atlantic when price cap regulation was adopted.

24. Finally, it is my opinion that omitted retirements identified in the Bell Atlantic plant accounting audit should not be deemed extraordinary.<sup>4</sup> It is a near certainty that posting these retirements when the plant was physically removed from service would not have changed past depreciation rates. Additionally, depreciation reserves for Bell Atlantic are more than adequate to accommodate current charges for the retirements. Omitted accounting retirements are a common

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<sup>4</sup>A retirement is considered extraordinary only if the following criteria are met:

- a. The impending retirement was not adequately considered in setting past depreciation rates.
- b. The charging of the retirement against the reserve will unduly deplete the reserve.
- c. The retirement is unusual such that similar retirements are not likely to recur in the future. 47 CFR, §32.2000(g)(4)(i).

occurrence for public utilities and should be recorded as a normal adjustment to prior period activity.

## Financial Model

The capital recovery and revenue requirement implications of omitted accounting retirements were examined in this study by the application of a financial model originally designed to investigate the ratemaking implications of asset impairment losses under competitive market pricing. While the model will simulate the interactive dynamics between a regulated incumbent and a non-regulated entrant, only the financial statements of the incumbent were considered in this study.

### Model Design

The model employed in this analysis produces a set of financial statements (*i.e.*, Balance Sheet, Income Statement and Statement of Cash Flows) for both a regulated entity (incumbent) and a non-regulated competitor (entrant). The time horizon of the model is 15 years. A non-regulated competitor is modeled to enter the market at the end of Year 4. All cash flows, price changes and plant accounting activity are modeled to occur at year end. Financial parameters can be specified for both the incumbent and the entrant. These parameters include: debt ratio; interest rate; cost of equity capital; current tax rate; deferred tax rate; dividend payout ratio; receipts lag; disbursements lag; and number of shares of common stock initially issued.

Accounts receivable and accounts payable (*i.e.*, working capital) are modeled by specifying a receipts lag and/or disbursements lag as a positive, real number between 0.0 and 1.0. A receivable is created for an amount equal to the product of the specified revenue lag factor and current period revenue. A payable is created for an amount equal to the product of the specified expenses lag factor and current period operating expenses. Receivables are collected and payables are remitted at the end of the next accounting period.

Construction expenditures and working capital needs are funded from a mix of internal and external sources. Securities are sold (or repurchased) in proportions necessary to maintain a specified debt ratio. Sales or repurchases of common stock are executed at book value. A zero cash balance is maintained for all accounting periods. Dividends are not paid if earnings are less than zero.

## 1. Plant Additions and Retirements

Units of plant capacity, initial installed cost per unit of plant additions and retirement frequency distributions are specified in the model for two technologies. Parameters for a plant account labeled "Old Technology" can be specified for both the incumbent and the entrant. Plant additions of Old Technology for activity year  $t$  are given by

$$A_t = C_0 U_t (1+i)^t + \sum_{j=0}^{t-1} R_{tj} K_t (1+i)^j; 0 \leq t \leq 15$$

where

- $A_t$  = plant addition
- $C_0$  = cost per unit of Old Technology at end of year 0
- $U_t$  = units installed in year  $t$
- $R_{tj}$  = retirements in year  $t$  from units installed in year  $j$
- $K_t$  =  $\{0, 1\}$
- $i$  = inflation rate of Old Technology.

Retirements are calculated from a retirement frequency distribution specified for each vintage addition. The parameter  $K_t$  is specified for each activity year to direct the model to replace retirements with either Old Technology or New Technology. Setting  $K_t = 1$  will cause retirements from Old Technology to be replaced with the current cost of Old Technology. Similarly, setting  $K_t = 0$  will cause retirements from Old Technology to be replaced with the current cost of New Technology.

Plant additions in year  $t$  for New Technology are given by

$$\hat{A}_t = \hat{C}_0 \hat{U}_t (1+\hat{i})^t + \sum_{j=0}^{t-1} \hat{R}_{tj} (1+\hat{i})^j + (1-K_t) \sum_{j=0}^{t-1} \frac{R_{tj} \hat{C}_0 (1+\hat{i})^{j+1}}{C_0 (1+i)^j}; 0 \leq t \leq 1$$

where all "hat" terms refer to New Technology parameters corresponding to the definition of parameters for Old Technology. Unlike retirements of Old Technology, however, the model does not permit retirements of New Technology to be replaced with Old Technology. Interim retirements of New Technology are always replaced with New Technology.

Replacements of interim retirements from either Old or New Technology are costed from a computation of the implied quantity of property units retired from service, given the dollar amount of retirements derived from prior vintage additions and the specified retirement

frequency distributions. This computation will permit fractional retirements. In particular, units of Old Technology retired in year  $t$  from vintage  $j$  ( $U_{tj}$ ) are given by

$$U_{tj} = \frac{R_{tj}}{C_0(1+i)^j}$$

and the replacement cost of  $U_{tj}$  with Old Technology becomes

$$\frac{R_{tj}C_0(1+i)^{j+1}}{C_0(1+i)^j} = R_{tj}(1+i).$$

Similarly, the replacement cost of  $U_{tj}$  with New Technology is given by

$$\frac{R_{tj}\bar{C}_0(1+i)^{j+1}}{C_0(1+i)^j}.$$

## 2. Book Depreciation

The model develops both straight-line and economic depreciation schedules for various sets of financial statements for the incumbent and the entrant. A depreciation system composed of the straight-line method, vintage group procedure, remaining-life technique is used to derive a pure revenue requirement calculation for the financial statements of the Incumbent Regulated and the Entrant who will price services to recover the measured revenue requirement. Economic depreciation is derived for both the Incumbent Regulated and the Entrant to validate the equivalency of straight-line and economic depreciation when revenue is equal to a revenue requirement derived from straight-line depreciation. Economic depreciation schedules are also derived from a set of financial statements for the incumbent when a) revenue is constrained by competitive market pricing; and b) the incumbent becomes the price leader by adopting economic depreciation.

## 3. Income Taxes

Current and deferred income taxes are calculated in the model using a tax rate specified for both components of the income tax expense. This treatment permits modeling either flow-through or normalized accounting of the timing difference between book and tax depreciation. If the deferred tax rate is set to 0 percent, the model will produce flow-through accounting. Similarly, if the deferred tax rate is set equal to the current tax rate, the model will produce normalized accounting.



Tax depreciation is calculated in the model using the sum-of-the-years'-digits method, vintage-group procedure, remaining-life technique. The tax depreciation rate, adjusted for a fractional-year remaining life, is given by

$$\text{Rate} = \frac{2RL}{(W + 2F)(W + 1)}$$

where

$$\begin{aligned} RL &= \text{vintage remaining life} \\ W &= \text{interger portion of } RL \\ F &= \text{fractional portion of } RL. \end{aligned}$$

Deferred taxes are calculated as the product of the specified deferred tax rate and the difference between accelerated tax depreciation and straight-line book depreciation accruals. The normalization to straight-line depreciation is applied regardless of the method of depreciation employed in a pricing strategy or the method adopted for financial reporting purposes. The cost basis and service life statistics used for book reporting purposes are also used in the calculation of allowed tax depreciation.

#### 4. Operating Expenses

Initial operating expense levels are established for both old and new technologies in year  $t=0$  by the specification of a unit cost  $E_0$  and  $\hat{E}_0$ , respectively. Initial operating expenses for units of old and new technology installed in year  $t>0$  are given by  $E_0(1+i)^t$  and  $\hat{E}_0(1+\hat{i})^t$ , respectively, where  $i$  and  $\hat{i}$  are specified rates of inflation. Operating expenses for units installed in year  $t$  are modeled to grow at rate  $g$  for old technology and rate  $\hat{g}$  for new technology. Thus, operating expenses in year  $t$  for vintage  $j$  of old technology are given by

$$OE_{tj} = E_0 A_j S_{tj} (1+i)^j (1+g)^{t-j}$$

where  $S_{tj}$  is the proportion of the  $j^{\text{th}}$  vintage surviving at the end of year  $t$ . Total operating expenses in year  $t$  attributable to all surviving vintages of both old and new technology is given by

$$\bar{E}_t = E_0 \sum_{j=0}^{t-1} A_j S_{tj} (1+i)^j (1+g)^{t-j} + \hat{E}_0 \sum_{j=0}^{t-1} \hat{A}_j \hat{S}_{tj} (1+\hat{i})^j (1+\hat{g})^{t-j}.$$

## 5. Revenue

The ability of an incumbent to compete against an entrant and to achieve capital recovery is largely determined by the price at which the entrant is willing to sell services. Annual revenue for the incumbent regulated (*i.e.*, no competition) is equal to the revenue requirement allowed under regulation. The revenue requirement under regulation is given by

$$\begin{aligned} \text{Revenue Requirement} = & \text{Operating Expenses} \\ & + \text{Depreciation} \\ & + \text{Current Income Taxes} \\ & + \text{Deferred Income Taxes} \\ & + (\text{Rate Base})(\text{Allowed Rate of Return}). \end{aligned}$$

Revenue collected by the incumbent in a competitive market (*i.e.*, acting as a price-taker) is specified by the product of the number of units sold  $q_t$  and the price per unit charged by the entrant. The number of units sold by the incumbent during any year  $t$  is equal to the cumulative available capacity of the incumbent which is given by

$$q_t = \sum_{j=0}^t (U_j + \hat{U}_j).$$

The price per unit at which the entrant is willing to sell services is derived from the ratio of the entrant's annual revenue requirement and cumulative production capacity. The market demand for services is considered sufficient to exhaust the productive capacity of both the incumbent and the entrant. Neither the incumbent nor the entrant are vulnerable to market share losses resulting from the pricing strategies of a competitor.

Revenue collected by the incumbent as a price leader is equal to the incumbent's annual revenue requirement derived from the adoption of economic depreciation. The schedule of economic depreciation is derived from the cash flows produced by the incumbent acting as a price taker. Depreciation expense recovered in the year the entrant enters the market (*i.e.*, Year 5) is equal to the sum of economic depreciation and a specified recoverable portion of any asset impairment measured at the end of the prior year.

Revenue collected by the incumbent as a regulated price leader is identical to the incumbent acting as a price leader absent regulation. The financial statements with regulation, however, are derived using straight-line depreciation. This permits an evaluation of the financial performance

observed by a regulator if the incumbent is precluded from adopting economic depreciation for ratemaking purposes. Regulation may, for example, adopt some form of incentive regulation in which the incumbent is permitted to adjust service rates within a range specified by achieved rates of return.

### Model Application

The query investigated in this affidavit was the potential change in revenue requirements attributable to omitted accounting retirements. Both the timing and the present value of revenue requirements were analyzed using the financial model to simulate omitted retirements. The base case in the analysis provided a posting of all retirements to the CPR and plant ledger. This case produced a present value of revenue requirements of \$5,582.20. A second case was modeled in which retirements from a vintage were not posted to the CPR. The case in which retirements were omitted produced a present value of revenue requirements of \$5,604.23. The components of the present value of the revenue requirements for these two cases are shown in Table 1.

	Retirements Posted	Retirements Omitted	Difference
Operating Expenses	\$1,035.64	\$1,035.64	\$0.00
Depreciation	3,506.78	3,476.79	(29.99)
Current Income Taxes	307.18	321.29	14.11
Deferred Income Taxes	54.49	58.47	3.98
Operating Income	678.12	712.05	33.93
Revenue Requirement	\$5,582.20	\$5,604.23	\$22.03

**Table 1. Present Value of Revenue Requirements**

It can be observed from Table 1 that the cause of the increase in revenue requirements when retirements are omitted is the income tax effect of reduced depreciation expense and higher taxable income. Absent income taxes, the present value of the revenue requirements would be identical for both cases. Note that regardless of the remaining life used in the calculation of depreciation expense, the present value of capital recovery remains \$3,686.90. It can be concluded from this analysis that achievement of capital recovery is not impacted by omitted retirements.

# Retirements Posted

## Financial Statements

End of Year	0	1	2	3	4	5	6	7
<b>BALANCE SHEET</b>								
<b>Assets:</b>								
Current Assets								
Plant	1,000.00	1,054.50	1,164.05	1,307.54	1,478.12	1,390.39	1,359.10	1,317.95
Depreciation Reserve		150.00	298.18	451.24	619.09	301.27	436.68	449.42
<b>Total Assets</b>	<b>\$1,000.00</b>	<b>\$904.50</b>	<b>\$865.88</b>	<b>\$856.30</b>	<b>\$859.03</b>	<b>\$1,089.12</b>	<b>\$922.42</b>	<b>\$868.53</b>
<b>Liabilities:</b>								
Current Liabilities								
Debt	600.00	497.70	453.26	442.30	450.23	604.98	484.70	457.68
Equity	400.00	317.40	275.83	257.65	252.32	344.68	249.97	220.32
Retained Earnings		14.40	26.34	37.22	47.84	58.64	73.16	84.80
Deferred Income Taxes		75.00	110.45	119.13	108.65	80.81	114.59	105.73
<b>Total Liabilities</b>	<b>\$1,000.00</b>	<b>\$904.50</b>	<b>\$865.88</b>	<b>\$856.30</b>	<b>\$859.03</b>	<b>\$1,089.12</b>	<b>\$922.42</b>	<b>\$868.53</b>
<b>INCOME STATEMENT</b>								
Revenue		\$493.00	\$494.04	\$528.72	\$586.53	\$661.23	\$676.97	\$643.26
Operating Expenses		105.00	115.94	133.46	150.86	167.27	120.50	112.30
Depreciation		250.00	263.63	291.01	333.94	390.41	417.32	419.48
Current Income Taxes		(27.00)	4.36	27.59	45.86	63.85	14.62	47.64
Deferred Income Taxes		75.00	35.45	8.67	(10.48)	(27.83)	33.78	(8.87)
Operating Income		90.00	74.66	67.99	66.35	67.53	90.75	72.70
Interest Expense		42.00	34.84	31.73	30.96	31.52	42.35	33.93
<b>Net Income</b>		<b>48.00</b>	<b>39.82</b>	<b>36.26</b>	<b>35.38</b>	<b>36.02</b>	<b>48.40</b>	<b>38.78</b>
Dividends		33.60	27.87	25.38	24.77	25.21	33.88	27.14
Retained Earnings		14.40	11.94	10.88	10.62	10.81	14.52	11.63
<b>STATEMENT OF CASH FLOWS</b>								
<b>Operating Activities:</b>								
Net Income		\$48.00	\$39.82	\$36.26	\$35.38	\$36.02	\$48.40	\$38.78
Change in Working Cap.								
Depreciation		250.00	263.63	291.01	333.94	390.41	417.32	419.48
Deferred Taxes		75.00	35.45	8.67	(10.48)	(27.83)	33.78	(8.87)
<b>Net Cash Flow</b>		<b>\$373.00</b>	<b>\$338.89</b>	<b>\$335.95</b>	<b>\$358.85</b>	<b>\$398.60</b>	<b>\$499.50</b>	<b>\$449.39</b>
<b>Investing Activities:</b>								
Capital Expenditures	(\$1,000.00)	(\$154.50)	(\$225.00)	(\$281.43)	(\$336.68)	(\$620.50)	(\$250.62)	(\$365.59)
<b>Net Cash Flow</b>	<b>(\$1,000.00)</b>	<b>(\$154.50)</b>	<b>(\$225.00)</b>	<b>(\$281.43)</b>	<b>(\$336.68)</b>	<b>(\$620.50)</b>	<b>(\$250.62)</b>	<b>(\$365.59)</b>
<b>Financing Activities:</b>								
Debt Proceeds	\$600.00	(\$102.30)	(\$44.44)	(\$10.95)	\$7.93	\$154.75	(\$120.29)	(\$27.02)
Equity Proceeds	400.00	(82.60)	(41.57)	(18.18)	(5.33)	92.36	(94.71)	(29.64)
Dividends Paid		(33.60)	(27.87)	(25.38)	(24.77)	(25.21)	(33.88)	(27.14)
<b>Net Cash Flow</b>	<b>\$1,000.00</b>	<b>(\$218.50)</b>	<b>(\$113.89)</b>	<b>(\$54.52)</b>	<b>(\$22.17)</b>	<b>\$221.90</b>	<b>(\$248.88)</b>	<b>(\$83.81)</b>
<b>Net Change in Cash</b>			<b>\$0.00</b>	<b>(\$0.00)</b>	<b>(\$0.00)</b>	<b>(\$0.00)</b>		<b>(\$0.00)</b>

# Retirements Posted

## Financial Statements

End of Year	8	9	10	11	12	13	14	15
<b>BALANCE SHEET</b>								
<b>Assets:</b>								
Current Assets								
Plant	1,277.52	1,243.27	1,235.37	1,227.15	1,218.77	1,210.60	1,202.53	
Depreciation Reserve	356.94	315.15	334.22	335.21	330.06	352.73	452.56	(0.00)
<b>Total Assets</b>	<b>\$920.58</b>	<b>\$928.13</b>	<b>\$901.14</b>	<b>\$891.94</b>	<b>\$888.71</b>	<b>\$857.86</b>	<b>\$749.97</b>	<b>\$0.00</b>
<b>Liabilities:</b>								
Current Liabilities								
Debt	500.09	504.34	484.81	480.19	480.16	463.18	405.58	0.00
Equity	237.61	228.44	203.32	188.61	177.06	154.22	104.70	(175.42)
Retained Earnings	95.78	107.78	119.89	131.52	143.05	154.57	165.69	175.42
Deferred Income Taxes	87.10	87.57	93.12	91.62	88.45	85.89	74.00	
<b>Total Liabilities</b>	<b>\$920.58</b>	<b>\$928.13</b>	<b>\$901.14</b>	<b>\$891.94</b>	<b>\$888.71</b>	<b>\$857.86</b>	<b>\$749.97</b>	<b>\$0.00</b>
<b>INCOME STATEMENT</b>								
Revenue	\$626.09	\$623.73	\$613.97	\$608.79	\$611.61	\$631.40	\$701.12	\$936.94
Operating Expenses	100.82	90.99	83.55	85.50	87.49	89.49	91.56	93.68
Depreciation	420.01	417.72	414.42	411.79	413.68	431.47	503.03	749.97
Current Income Taxes	55.25	39.54	34.79	40.29	41.59	40.96	48.95	106.45
Deferred Income Taxes	(18.63)	0.47	5.56	(1.51)	(3.17)	(2.55)	(11.89)	(74.00)
Operating Income	68.65	75.01	75.65	72.72	72.03	72.02	69.48	60.84
Interest Expense	32.04	35.01	35.30	33.94	33.61	33.61	32.42	28.39
<b>Net Income</b>	<b>36.61</b>	<b>40.01</b>	<b>40.35</b>	<b>38.78</b>	<b>38.42</b>	<b>38.41</b>	<b>37.05</b>	<b>32.45</b>
Dividends	25.63	28.00	28.24	27.15	26.89	26.89	25.94	22.71
Retained Earnings	10.98	12.00	12.10	11.64	11.52	11.52	11.12	9.73
<b>STATEMENT OF CASH FLOWS</b>								
<b>Operating Activities:</b>								
Net Income	\$36.61	\$40.01	\$40.35	\$38.78	\$38.42	\$38.41	\$37.05	\$32.45
Change in Working Cap.								
Depreciation	420.01	417.72	414.42	411.79	413.68	431.47	503.03	749.97
Deferred Taxes	(18.63)	0.47	5.56	(1.51)	(3.17)	(2.55)	(11.89)	(74.00)
<b>Net Cash Flow</b>	<b>\$437.99</b>	<b>\$458.20</b>	<b>\$460.33</b>	<b>\$449.07</b>	<b>\$448.92</b>	<b>\$467.33</b>	<b>\$528.19</b>	<b>\$708.42</b>
<b>Investing Activities:</b>								
Capital Expenditures	(\$472.06)	(\$425.27)	(\$387.44)	(\$402.59)	(\$410.45)	(\$400.62)	(\$395.14)	
<b>Net Cash Flow</b>	<b>(\$472.06)</b>	<b>(\$425.27)</b>	<b>(\$387.44)</b>	<b>(\$402.59)</b>	<b>(\$410.45)</b>	<b>(\$400.62)</b>	<b>(\$395.14)</b>	
<b>Financing Activities:</b>								
Debt Proceeds	\$42.41	\$4.25	(\$19.52)	(\$4.62)	(\$0.03)	(\$16.98)	(\$57.60)	(\$405.58)
Equity Proceeds	17.29	(9.17)	(25.12)	(14.71)	(11.55)	(22.84)	(49.52)	(280.12)
Dividends Paid	(25.63)	(28.00)	(28.24)	(27.15)	(26.89)	(26.89)	(25.94)	(22.71)
<b>Net Cash Flow</b>	<b>\$34.07</b>	<b>(\$32.93)</b>	<b>(\$72.89)</b>	<b>(\$46.48)</b>	<b>(\$38.47)</b>	<b>(\$66.71)</b>	<b>(\$133.05)</b>	<b>(\$708.42)</b>
<b>Net Change in Cash</b>	<b>\$0.00</b>	<b>(\$0.00)</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>(\$0.00)</b>	<b>(\$0.00)</b>	<b>(\$0.00)</b>	

# Retirements Posted

## Capital Recovery

End of Year	Capital Recovery				Capital Expenditures	Change in Work. Cap.	Total	7.00% Debt	12.00% Equity
	Return	Depreciation	Deferred Tax	Total					
	A	B	C	D=A+B+C	E	F	G=E+F	H	I
0					1,000.00		1,000.00	(600.00)	(400.00)
1	90.00	250.00	75.00	415.00	154.50		154.50	144.30	116.20
2	74.66	263.63	35.45	373.73	225.00		225.00	79.28	69.45
3	67.99	291.01	8.67	367.68	281.43		281.43	42.68	43.56
4	66.35	333.94	(10.48)	389.81	336.68		336.68	23.03	30.10
5	67.53	390.41	(27.83)	430.11	620.50		620.50	(123.24)	(67.15)
6	90.75	417.32	33.78	541.85	250.62		250.62	162.64	128.59
7	72.70	419.48	(8.87)	483.32	365.59		365.59	60.95	56.79
8	68.65	420.01	(18.63)	470.03	472.06		472.06	(10.37)	8.34
9	75.01	417.72	0.47	493.21	425.27		425.27	30.76	37.18
10	75.65	414.42	5.56	495.63	387.44		387.44	54.83	53.36
11	72.72	411.79	(1.51)	483.00	402.59		402.59	38.55	41.86
12	72.03	413.68	(3.17)	482.54	410.45		410.45	33.65	38.44
13	72.02	431.47	(2.55)	500.94	400.62		400.62	50.59	49.73
14	69.48	503.03	(11.89)	560.61	395.14		395.14	90.02	75.45
15	60.84	749.97	(74.00)	736.81				433.97	302.83
PV	598.40	3,026.58	61.92	3,686.90	3,686.90		3,686.90	600.00	400.00

## Retirements Posted Economic Depreciation

End of Year	Net Revenue				Working Capital			Capital Expenditures		Deferred Tax		Carrying Value	Economic Depreciation
	Revenue	Expenses	Net	Pres. Value	Balance	Change	Pres. Value	Annual	Pres. Value	Annual	Cumulative		
	A	B	C=A-B	D	E	F=E(t)-E(t-1)	G	H	I	J	K	L=D-E-G-I+K	M=L(t-1)-L(t)+H
0				\$3,686.90				\$1,000.00	\$2,686.90			\$1,000.00	
1	\$493.00	\$78.00	\$415.00	3,603.72				154.50	2,774.22	\$75.00	\$75.00	904.50	\$250.00
2	494.04	120.30	373.73	3,554.32				225.00	2,798.90	35.45	110.45	865.88	263.63
3	528.72	161.05	367.68	3,506.54				281.43	2,769.36	8.67	119.13	856.30	291.01
4	586.53	196.72	389.81	3,432.32				336.68	2,681.93	(10.48)	108.65	859.03	333.94
5	661.23	231.12	430.11	3,311.11				620.50	2,302.80	(27.83)	80.81	1,089.12	390.41
6	676.97	135.12	541.85	3,067.27				250.62	2,259.44	33.78	114.59	922.42	417.32
7	643.26	159.94	483.32	2,860.00				365.59	2,097.20	(8.87)	105.73	868.53	419.48
8	626.09	156.07	470.03	2,647.37				472.06	1,813.89	(18.63)	87.10	920.58	420.01
9	623.73	130.53	493.21	2,392.42				425.27	1,551.86	0.47	87.57	928.13	417.72
10	613.97	118.34	495.63	2,112.11				387.44	1,304.09	5.56	93.12	901.14	414.42
11	608.79	125.79	483.00	1,819.20				402.59	1,018.87	(1.51)	91.62	891.94	411.79
12	611.61	129.08	482.54	1,500.39				410.45	700.12	(3.17)	88.45	888.71	413.68
13	631.40	130.45	500.94	1,134.48				400.62	362.51	(2.55)	85.89	857.86	431.47
14	701.12	140.51	560.61	675.97				395.14		(11.89)	74.00	749.97	503.03
15	936.94	200.13	736.81							(74.00)			749.97
PV	\$5,582.20	\$1,342.81	\$3,686.90					\$3,686.90		\$61.92			\$3,026.58

# Retirements Omitted

## Financial Statements

End of Year	0	1	2	3	4	5	6	7
<b>BALANCE SHEET</b>								
<b>Assets:</b>								
Current Assets								
Plant	1,000.00	1,054.50	1,179.50	1,338.44	1,524.47	1,452.19	1,513.60	1,472.45
Depreciation Reserve		150.00	286.04	430.82	594.26	275.88	491.86	515.63
<b>Total Assets</b>	<b>\$1,000.00</b>	<b>\$904.50</b>	<b>\$893.47</b>	<b>\$907.61</b>	<b>\$930.21</b>	<b>\$1,176.30</b>	<b>\$1,021.74</b>	<b>\$956.81</b>
<b>Liabilities:</b>								
Current Liabilities								
Debt	600.00	497.70	473.89	476.96	493.72	653.21	534.36	500.06
Equity	400.00	317.40	289.58	280.26	279.98	374.46	279.55	243.85
Retained Earnings		14.40	26.34	37.72	49.17	61.01	76.69	89.52
Deferred Income Taxes		75.00	103.65	112.68	107.35	87.62	131.15	123.38
<b>Total Liabilities</b>	<b>\$1,000.00</b>	<b>\$904.50</b>	<b>\$893.47</b>	<b>\$907.61</b>	<b>\$930.21</b>	<b>\$1,176.30</b>	<b>\$1,021.74</b>	<b>\$956.81</b>
<b>INCOME STATEMENT</b>								
Revenue		\$493.00	\$466.45	\$509.74	\$574.64	\$655.23	\$675.92	\$665.72
Operating Expenses		105.00	115.94	133.46	150.86	167.27	120.50	112.30
Depreciation		250.00	236.04	267.29	314.08	374.41	405.18	430.52
Current Income Taxes		(27.00)	11.17	28.88	43.49	59.22	8.74	50.51
Deferred Income Taxes		75.00	28.65	9.03	(5.33)	(19.72)	43.52	(7.76)
Operating Income		90.00	74.66	71.08	71.54	74.06	97.98	80.15
Interest Expense		42.00	34.84	33.17	33.39	34.56	45.72	37.41
<b>Net Income</b>		<b>48.00</b>	<b>39.82</b>	<b>37.91</b>	<b>38.16</b>	<b>39.50</b>	<b>52.26</b>	<b>42.75</b>
Dividends		33.60	27.87	26.54	26.71	27.65	36.58	29.92
Retained Earnings		14.40	11.94	11.37	11.45	11.85	15.68	12.82
<b>STATEMENT OF CASH FLOWS</b>								
<b>Operating Activities:</b>								
Net Income		\$48.00	\$39.82	\$37.91	\$38.16	\$39.50	\$52.26	\$42.75
Change in Working Cap.								
Depreciation		250.00	236.04	267.29	314.08	374.41	405.18	430.52
Deferred Taxes		75.00	28.65	9.03	(5.33)	(19.72)	43.52	(7.76)
<b>Net Cash Flow</b>		<b>\$373.00</b>	<b>\$304.50</b>	<b>\$314.23</b>	<b>\$346.90</b>	<b>\$394.18</b>	<b>\$500.96</b>	<b>\$465.51</b>
<b>Investing Activities:</b>								
Capital Expenditures	(\$1,000.00)	(\$154.50)	(\$225.00)	(\$281.43)	(\$336.68)	(\$620.50)	(\$250.62)	(\$365.59)
<b>Net Cash Flow</b>	<b>(\$1,000.00)</b>	<b>(\$154.50)</b>	<b>(\$225.00)</b>	<b>(\$281.43)</b>	<b>(\$336.68)</b>	<b>(\$620.50)</b>	<b>(\$250.62)</b>	<b>(\$365.59)</b>
<b>Financing Activities:</b>								
Debt Proceeds	\$600.00	(\$102.30)	(\$23.81)	\$3.07	\$16.76	\$159.49	(\$118.85)	(\$34.30)
Equity Proceeds	400.00	(82.60)	(27.82)	(9.33)	(0.27)	94.48	(94.91)	(35.69)
Dividends Paid		(33.60)	(27.87)	(26.54)	(26.71)	(27.65)	(36.58)	(29.92)
<b>Net Cash Flow</b>	<b>\$1,000.00</b>	<b>(\$218.50)</b>	<b>(\$79.49)</b>	<b>(\$32.80)</b>	<b>(\$10.22)</b>	<b>\$226.31</b>	<b>(\$250.34)</b>	<b>(\$99.92)</b>
<b>Net Change in Cash</b>			<b>\$0.00</b>	<b>(\$0.00)</b>	<b>(\$0.00)</b>	<b>\$0.00</b>	<b>(\$0.00)</b>	<b>\$0.00</b>



# Retirements Omitted

## Financial Statements

End of Year	8	9	10	11	12	13	14	15
<b>BALANCE SHEET</b>								
<b>Assets:</b>								
Current Assets								
Plant	1,432.02	1,397.77	1,389.87	1,381.65	1,373.27	1,365.10	1,357.03	
Depreciation Reserve	434.19	403.43	433.54	445.57	451.45	485.16	596.02	(0.00)
<b>Total Assets</b>	<b>\$997.83</b>	<b>\$994.34</b>	<b>\$956.32</b>	<b>\$936.08</b>	<b>\$921.82</b>	<b>\$879.94</b>	<b>\$761.01</b>	<b>\$0.00</b>
<b>Liabilities:</b>								
Current Liabilities								
Debt	535.62	533.47	507.99	497.85	492.74	471.13	409.33	0.00
Equity	255.56	241.27	211.48	192.53	177.18	150.94	98.44	(184.27)
Retained Earnings	101.52	114.37	127.18	139.37	151.32	163.14	174.45	184.27
Deferred Income Taxes	105.12	105.22	109.68	106.33	100.58	94.72	78.79	
<b>Total Liabilities</b>	<b>\$997.83</b>	<b>\$994.34</b>	<b>\$956.32</b>	<b>\$936.08</b>	<b>\$921.82</b>	<b>\$879.94</b>	<b>\$761.01</b>	<b>\$0.00</b>
<b>INCOME STATEMENT</b>								
Revenue	\$646.88	\$642.94	\$631.71	\$625.16	\$626.71	\$645.33	\$713.98	\$948.84
Operating Expenses	100.82	90.99	83.55	85.50	87.49	89.49	91.56	93.68
Depreciation	431.04	428.76	425.46	422.82	424.71	442.51	514.06	761.01
Current Income Taxes	58.27	42.75	38.22	43.99	45.57	45.28	53.63	111.53
Deferred Income Taxes	(18.26)	0.10	4.45	(3.35)	(5.75)	(5.86)	(15.94)	(78.79)
Operating Income	75.01	80.34	80.02	76.20	74.68	73.91	70.67	61.40
Interest Expense	35.00	37.49	37.34	35.56	34.85	34.49	32.98	28.65
<b>Net Income</b>	<b>40.00</b>	<b>42.85</b>	<b>42.68</b>	<b>40.64</b>	<b>39.83</b>	<b>39.42</b>	<b>37.69</b>	<b>32.75</b>
Dividends	28.00	29.99	29.87	28.45	27.88	27.59	26.38	22.92
Retained Earnings	12.00	12.85	12.80	12.19	11.95	11.83	11.31	9.82
<b>STATEMENT OF CASH FLOWS</b>								
<b>Operating Activities:</b>								
Net Income	\$40.00	\$42.85	\$42.68	\$40.64	\$39.83	\$39.42	\$37.69	\$32.75
Change in Working Cap.								
Depreciation	431.04	428.76	425.46	422.82	424.71	442.51	514.06	761.01
Deferred Taxes	(18.26)	0.10	4.45	(3.35)	(5.75)	(5.86)	(15.94)	(78.79)
<b>Net Cash Flow</b>	<b>\$452.78</b>	<b>\$471.71</b>	<b>\$472.59</b>	<b>\$460.12</b>	<b>\$458.80</b>	<b>\$476.06</b>	<b>\$535.82</b>	<b>\$714.97</b>
<b>Investing Activities:</b>								
Capital Expenditures	(\$472.06)	(\$425.27)	(\$387.44)	(\$402.59)	(\$410.45)	(\$400.62)	(\$395.14)	
<b>Net Cash Flow</b>	<b>(\$472.06)</b>	<b>(\$425.27)</b>	<b>(\$387.44)</b>	<b>(\$402.59)</b>	<b>(\$410.45)</b>	<b>(\$400.62)</b>	<b>(\$395.14)</b>	
<b>Financing Activities:</b>								
Debt Proceeds	\$35.57	(\$2.15)	(\$25.48)	(\$10.13)	(\$5.11)	(\$21.61)	(\$61.79)	(\$409.33)
Equity Proceeds	11.71	(14.29)	(29.79)	(18.95)	(15.36)	(26.23)	(52.50)	(282.71)
Dividends Paid	(28.00)	(29.99)	(29.87)	(28.45)	(27.88)	(27.59)	(26.38)	(22.92)
<b>Net Cash Flow</b>	<b>\$19.27</b>	<b>(\$46.44)</b>	<b>(\$85.15)</b>	<b>(\$57.53)</b>	<b>(\$48.35)</b>	<b>(\$75.44)</b>	<b>(\$140.68)</b>	<b>(\$714.97)</b>
<b>Net Change in Cash</b>	<b>\$0.00</b>	<b>(\$0.00)</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>(\$0.00)</b>	<b>(\$0.00)</b>	<b>(\$0.00)</b>	<b>\$0.00</b>

# Retirements Omitted

## Capital Recovery

End of Year	Capital Recovery				Capital Expenditures	Change in Work. Cap.	Total	7.00% Debt	12.00% Equity
	Return	Depreciation	Deferred Tax	Total					
	A	B	C	D=A+B+C	E	F	G=E+F	H	I
0					1,000.00		1,000.00	(600.00)	(400.00)
1	90.00	250.00	75.00	415.00	154.50		154.50	144.30	116.20
2	74.66	236.04	28.65	339.34	225.00		225.00	58.65	55.69
3	71.08	267.29	9.03	347.40	281.43		281.43	30.11	35.87
4	71.54	314.08	(5.33)	380.29	336.68		336.68	16.63	26.98
5	74.06	374.41	(19.72)	428.74	620.50		620.50	(124.93)	(66.83)
6	97.98	405.18	43.52	546.68	250.62		250.62	164.57	131.49
7	80.15	430.52	(7.76)	502.91	365.59		365.59	71.71	65.62
8	75.01	431.04	(18.26)	487.79	472.06		472.06	(0.56)	16.29
9	80.34	428.76	0.10	509.20	425.27		425.27	39.65	44.29
10	80.02	425.46	4.45	509.93	387.44		387.44	62.83	59.67
11	76.20	422.82	(3.35)	495.67	402.59		402.59	45.69	47.40
12	74.68	424.71	(5.75)	493.64	410.45		410.45	39.96	43.24
13	73.91	442.51	(5.86)	510.56	400.62		400.62	56.11	53.83
14	70.67	514.06	(15.94)	568.80	395.14		395.14	94.77	78.89
15	61.40	761.01	(78.79)	743.62				437.99	305.64
PV	628.01	2,992.77	66.11	3,686.90	3,686.90		3,686.90	600.00	400.00

## Retirements Omitted Economic Depreciation

End of Year	Net Revenue				Working Capital			Capital Expenditures		Deferred Tax		Carrying Value	Economic Depreciation
	Revenue	Expenses	Net	Pres. Value	Balance	Change	Pres. Value	Annual	Pres. Value	Annual	Cumulative		
	A	B	C=A-B	D	E	F=E(t)-E(t-1)	G	H	I	J	K	L=D-E-G-I+K	M=L(t-1)-L(t)+H
0				\$3,686.90				\$1,000.00	\$2,686.90			\$1,000.00	
1	\$493.00	\$78.00	\$415.00	3,603.72				154.50	2,774.22	\$75.00	\$75.00	904.50	\$250.00
2	466.45	127.11	339.34	3,588.72				225.00	2,798.90	28.65	103.65	893.47	236.04
3	509.74	162.34	347.40	3,564.30				281.43	2,769.36	9.03	112.68	907.61	267.29
4	574.64	194.35	380.29	3,504.80				336.68	2,681.93	(5.33)	107.35	930.21	314.08
5	655.23	226.49	428.74	3,391.48				620.50	2,302.80	(19.72)	87.62	1,176.30	374.41
6	675.92	129.24	546.68	3,150.03				250.62	2,259.44	43.52	131.15	1,021.74	405.18
7	665.72	162.81	502.91	2,930.62				365.59	2,097.20	(7.76)	123.38	956.81	430.52
8	646.88	159.09	487.79	2,706.59				472.06	1,813.89	(18.26)	105.12	997.83	431.04
9	642.94	133.74	509.20	2,440.98				425.27	1,551.86	0.10	105.22	994.34	428.76
10	631.71	121.77	509.93	2,150.73				387.44	1,304.09	4.45	109.68	956.32	425.46
11	625.16	129.49	495.67	1,848.63				402.59	1,018.87	(3.35)	106.33	936.08	422.82
12	626.71	133.06	493.64	1,521.36				410.45	700.12	(5.75)	100.58	921.82	424.71
13	645.33	134.77	510.56	1,147.72				400.62	362.51	(5.86)	94.72	879.94	442.51
14	713.98	145.19	568.80	682.22				395.14		(15.94)	78.79	761.01	514.06
15	948.84	205.21	743.62							(78.79)			761.01
PV	\$5,604.23	\$1,356.92	\$3,686.90					\$3,686.90		\$66.11			\$2,992.77

## Remaining Life Weights

Suppose that the estimated projection curve and projection life are unaffected by the omitted retirements. This can occur, for example, if the omitted retirements are small in relation to the collection of retirements used in the life analysis or if the projection curve and projection life were selected with little weight given to the life analysis. Under these conditions, omitted retirements may or may not change the composite remaining life of a plant category, depending upon the structure of the generation arrangement.

The composite remaining life of a plant category is a reciprocal or harmonic weighted average of the remaining lives ( $r_i$ ) of the vintages represented in the age distribution. The average remaining life can be expressed mathematically as

$$\text{Average Remaining Life} = \frac{W_1 + W_2 + \dots + W_n}{\frac{W_1}{r_1} + \frac{W_2}{r_2} + \dots + \frac{W_n}{r_n}}$$

where the weight ( $W_i$ ) is the theoretical net plant of each vintage given by

$$W_i = \frac{(\text{Plant}_i)(r_i)}{L_i}$$

and  $L_i$  is the average service life of the vintage.

A weight  $W_i$  will increase when omitted retirements are added to the age distribution and the percentage change in plant is greater than the percentage change in the average service life ( $L_i$ ). The change in the average service life, however, is a function of the realized life of the vintage. Therefore, the magnitude and direction of any change in the composite remaining life is dependent upon the vintage year, age and size of the omitted retirements. In general, the remaining life of a plant category will increase when plant is added to a vintage in the age distribution and the age of the vintage is less than the average remaining life of the category prior to the plant adjustment. Similarly, the remaining life will decrease if the age of the vintage year is greater than the average remaining life prior to the plant adjustment.<sup>5</sup> It follows from these dynamics that the direction of any change in the remaining life created by the structure of the generation arrangement can offset changes in the projection curve and projection life created by including or excluding omitted retirements from a life analysis.

<sup>5</sup>The converse of this relationship holds when the age distribution is reduced by omitted retirements.

It is nearly impossible, therefore, to predict the size and direction of a change in the remaining life of a plant category when the age distribution is adjusted for omitted retirements and the actual age of the retirements is unknown. It can be shown, however, that the change will be negligible if the omitted retirements are small in relation to the age distribution of surviving plant or the retirements are widely distributed over a broad range of vintages. Absent a significant change in the remaining life, revenue requirements will not be affected by omitted retirements.

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## CURRICULUM VITAE

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### EDUCATION

Valparaiso University (1961-1964)  
Major: Electrical Engineering  
B.S., Iowa State University (1965)  
Major: Engineering Operations  
M.S., Iowa State University (1968)  
Major: Engineering Valuation  
Thesis: The Multivariate Normal Distribution  
and the Simulated Plant Record Method of Life Analysis  
Ph.D., Iowa State University (1977)  
Major: Engineering Valuation  
Minor: Economics  
Dissertation: A Comparative Analysis of Various Estimates  
of the Hazard Rate Associated With the Service Life of Industrial Property

### EMPLOYMENT

1996 – Present	Executive Vice President Foster Associates, Inc.
1988 – 1996	Senior Vice President Foster Associates, Inc.
1979 – 1988	Vice President Foster Associates, Inc.
1978 – 1979	Assistant Treasurer Northern States Power Company
1974 – 1978	Manager, Corporate Economics Northern States Power Company
1972 – 1974	Corporate Economist Northern States Power Company
1970 – 1972	Graduate Student and Instructor Iowa State University
1968 – 1970	Valuation Engineer Northern States Power Company
1965 – 1968	Graduate Student and Teaching Assistant Iowa State University

## PUBLICATIONS

- A New Set of Generalized Survivor Tables*, Journal of the Society of Depreciation Professionals, October, 1992.
- The Theory and Practice of Depreciation Accounting Under Public Utility Regulation*, Journal of the Society of Depreciation Professionals, December, 1989.
- Standards for Depreciation Accounting Under Regulated Competition*, paper presented at The Institute for Study of Regulation, Rate Symposium, February, 1985.
- The Economics of Price-Level Depreciation*, paper presented at the Iowa State University Regulatory Conference, May, 1981.
- Depreciation and the Discount Rate for Capital Investment Decisions*, paper presented at the National Communications Forum - National Electronics Conference, October 1979.
- A Computerized Method for Generating a Life Table From the 'h-System' of Survival Functions*, paper presented at the American Gas Association - Edison Electric Institute Depreciation Accounting Committee Meeting, December, 1975.
- The Problem With AFDC is . . .*, paper presented at the Iowa State University Conference on Public Utility Valuation and the Rate Making Process, May, 1973.
- The Simulated Plant-Record Method of Life Analysis*, paper presented at the Missouri Public Service Commission Regulatory Information Systems Conference, May, 1971.
- Simulated Plant-Record Survivor Analysis Program (User's Manual)*, special report published by Engineering Research Institute, Iowa State University, February, 1971.
- A Test Procedure for the Simulated Plant-Record Method of Life Analysis*, Journal of the American Statistical Association, September, 1970.
- Modeling the Behavior of Property Records*, paper presented at the Iowa State University Conference on Public Utility Valuation and the Rate Making Process, May, 1970.
- A Technique for Simulating the Retirement Experience of Limited-Life Industrial Property*, paper presented at the National Conference of Electric and Gas Utility Accountants, May, 1969.
- How Dependable are Simulated Plant-Record Estimates?*, paper presented at the Iowa State University Conference on Public Utility Valuation and the Rate Making Process, April, 1968.

## EXPERT OPINION

Expert opinion provided in more than 80 administrative and judicial proceedings before state and federal agencies throughout the United States and Canada. Issues addressed in testimony have included depreciation, valuation, engineering economy, rate of return, and disclosure of asset impairment losses.

## OTHER CONSULTING ACTIVITIES

- Affidavit on behalf of Continental Cablevision, Inc. and its operating cable television systems regarding basic broadcast tier and equipment and installation cost-of-service rate justification.
- Office of Chief Counsel, Internal Revenue Service. In Re: Kansas City Southern Railway Co., et. al. Docket Nos. 971-72, 974-72, and 4788-73.
- Office of Chief Counsel, Internal Revenue Service. In Re: Northern Pacific Railway Co., Docket No. 4489-69.

United States Department of Justice. In Re: Burlington Northern Inc. v. United States, Ct. Cl. No. 30-72.

## **FACULTY**

Depreciation Programs for public utility commissions, companies, and consultants, sponsored by Depreciation Programs, Inc., in cooperation with Western Michigan University. (1980 - present)

Depreciation Advocacy Workshop, a three-day team training workshop on preparation, presentation, and defense of contested depreciation issues, sponsored by Gilbert Associates, Inc., October, 1979.

Corporate Economics Course, Employee Education Program, Northern States Power Company. (1968 - 1979)

Perspectives of Top Financial Executives, Course No. 5-300, University of Minnesota, September, 1978.

Depreciation Programs for public utility commissions, companies, and consultants, jointly sponsored by Western Michigan University and Michigan Technological University, 1973.

## **PROFESSIONAL ASSOCIATIONS**

Advisory Committee to the Institute for Study of Regulation, sponsored by the American University and The University of Missouri-Columbia.

American Economic Association.

American Gas Association - Edison Electric Institute Depreciation Accounting Committee.

Board of Directors, Iowa State Regulatory Conference.

Edison Electric Institute, Energy Analysis Division, Economic Advisory Committee, 1976-1980.

Financial Management Association.

The Institute of Electrical and Electronics Engineers, Inc., Power Engineering Society, Engineering and Planning Economics Working Group.

Midwest Finance Association.

Society of Depreciation Professionals (Founding Member and Chairman, Policy Committee)

## **MODERATOR**

Depreciation Open Forum, Iowa State University Regulatory Conference, May 1991.

The Quantification of Risk and Uncertainty in Engineering Economic Studies, Iowa State University Regulatory Conference, May 1989.

Plant Replacement Decisions with Added Revenue from New Service Offerings, Iowa State University Regulatory Conference, May 1988.

Economic Depreciation, Iowa State University Regulatory Conference, May 1987.

Opposing Views on the Use of Customer Discount Rates in Revenue Requirement Comparisons, Iowa State University Regulatory Conference, May 1986.

Cost of Capital Consequences of Depreciation Policy, Iowa State University Regulatory Conference, May 1985.



Concepts of Economic Depreciation, Iowa State University Regulatory Conference, May 1984.

Ratemaking Treatment of Large Capacity Additions, Iowa State University Regulatory Conference, May 1983.

The Economics of Excess Capacity, Iowa State University Regulatory Conference, May 1982.

New Developments in Engineering Economics, Iowa State University Regulatory Conference, May 1980.

Training in Engineering Economy, Iowa State University Regulatory Conference, May 1979.

The Real Time Problem of Capital Recovery, Missouri Public Service Commission, Regulatory Information Systems Conference, September 1974.

## **SPEAKER**

Economic Depreciation, AGA Accounting Services Committee and EEI Property Accounting and Valuation Committee, May 1998.

Discontinuation of Application of FASB Statement No. 71, Southern Natural Gas Company Accounting Seminar, April 1998.

Forecasting in Depreciation, Society of Depreciation Professionals Annual Meeting, September 1997.

Economic Depreciation In Response to Competitive Market Pricing, 1997 TELUS Depreciation Conference, June 1997.

Valuation of Special Franchise Property, City of New York, Department of Finance Valuation Seminar, March 1997.

Depreciation Implications of FAS Exposure Draft 158-B, 1996 TLG Decommissioning Conference, October 1996.

Why Economic Depreciation?, American Gas Association Depreciation Accounting Committee Meeting, August 1995.

The Theory of Economic Depreciation, Society of Depreciation Professionals Annual Meeting, November 1994.

Vintage Depreciation Issues, G & T Accounting and Finance Association Conference, June 1994.

Pricing and Depreciation Strategies for Segmented Markets (Regulated and Competitive), Iowa State Regulatory Conference, May 1990.

Principles and Practices of Depreciation Accounting, Canadian Electrical Association and Nova Scotia Power Electric Utility Regulatory Seminar, December 1989.

Principles and Practices of Depreciation Accounting, Duke Power Accounting Seminar, September 1989.

The Theory and Practice of Depreciation Accounting Under Public Utility Regulation, GTE Capital Recovery Managers Conference, February 1989.

Valuation Methods for Regulated Utilities, GTE Capital Recovery Managers Conference, January 1988.

Depreciation Principles and Practices for REA Borrowers, NRECA 1985 National Accounting and Finance Conference, September 1985.

Depreciation Principles and Practices for REA Borrowers, REA-CPA 1985 Seminars, August - September 1985.

Depreciation Principles and Practices for REA Borrowers, Kentucky Association of Electric Cooperatives, Inc., Summer Accountants Association Meeting, June 1985.

Considerations in Conducting a Depreciation Study, NRECA 1984 National Accounting and Finance Conference, October 1984.

Software for Conducting Depreciation Studies on a Personal Computer, United States Independent Telephone Association, September 1984.

Depreciation—An Assessment of Current Practices, NRECA 1983 National Accounting and Finance Conference, September 1983

Depreciation—An Assessment of Current Practices, REA National Field Conference, September 1983.

An Overview of Depreciation Systems, Iowa State Commerce Commission, October 1982.

Depreciation Practices for Gas Utilities, Regulatory Committee of the Canadian Gas Association, September 1981.

Practice, Theory, and Needed Research on Capital Investment Decisions in the Energy Supply Industry, workshop, sponsored by Michigan State University and the Electric Power Research Institute, November 1977.

Depreciation Concepts Under Regulation, Public Utilities Conference, sponsored by The University of Texas at Dallas, July 1976.

Electric Utility Economics, Mid-Continent Area Power Pool, May 1974.

## **HONORS AND AWARDS**

The Society of Sigma Xi.

Professional Achievement Citation in Engineering, Iowa State University, 1993.

**Specific Issues Raised By the FCC In Response to the 1993-94 Audits**  
**Have Been Addressed**

The draft audit reports refer to previous audits performed in 1993-94. The issues raised in the 1994 audit findings have been addressed by Bell Atlantic and have not reemerged as problems in the current audit. To the extent the audit staff has identified new concerns in the draft audit report here, the limited findings of the prior audit do not justify imposing any penalties here.

On April 20, 1994, the chief of the FCC Audits Branch sent an audit report letter to Bell Atlantic detailing the audit staff's findings concerning its audit of two Bell Atlantic telephone companies' central office equipment (D.C. and Pennsylvania). This was the only formal communication Bell Atlantic received on this audit. NYNEX, which had been subject to a similar audit, never received a findings letter.

Bell Atlantic responded to the issues raised, both with corrective action and with formal replies (filed May 27, 1994, August 1, 1994 and July 25, 1995). The audit staff did not find that Bell Atlantic continuing property records were generally inadequate, but rather that "certain" "procedures and practices for investment identified as cross connections, undetailed investment and unallocated other costs" were not in accordance with Part 32. Audit Report at 2. It was those procedures and practices that were the subject of Bell Atlantic's corrective action. The result of the corrective action was that the problems identified in the 1994 audit did not reoccur in the current audit.

The 1994 audit performed a physical inventory of a non-statistical sample of central office equipment in Bell Atlantic- DC and Bell Atlantic-PA. The audit report indicated that the auditors were able to locate most central office hard wired equipment

“without any problems.” *Id.* Where they did encounter difficulty specifically identifying sampled items, the staff explained the reason for most of their difficulties. These reasons tied back to the specific concerns identified in the report, and subsequently remedied by Bell Atlantic. At no point did the report suggest a more general failure in Bell Atlantic’s property records. With respect to the six specific areas of concern raised in the audit report, Bell Atlantic has responded, both by formally responding to the Commission and with corrective action.

**1. Cross Connection Investment.** The audit report concluded that Bell Atlantic (at least the Pennsylvania company) was not properly retiring the embedded cross connection investment (equipment that connects from one frame or piece of equipment to another within a central office) associated with older switching equipment. Bell Atlantic investigated the Commission concern and concluded that retirement of embedded cross connect investment was completed in 1994. BA May 27 Response at 2. The only exception was some investment (located in the Delaware and Pennsylvania companies) that should have been associated with new switch installation (and therefore was not appropriate to retire). These dollars were reassigned and Bell Atlantic retired the CPR number related to this outdated investment. Bell Atlantic confirmed the completion of this corrective action in a July 25, 1995 letter to the Accounting and Audits Division.

**2. Undetailed Switch Investment.** When Bell Atlantic converted its records to the current CPR system, a portion of the investment in switching equipment was not assigned a specific CPR number, but remained “undetailed investment.” At the time of the 1992 audit, Bell Atlantic had \$171 million in undetailed investment. The audit report concluded that this investment should either be supported through a physical inventory or

retired. Bell Atlantic created a five step plan to eliminate the undetailed investment. BA August 1 Response. Through these procedures, Bell Atlantic has eliminated the material balance of undetailed investment.

**3. Unallocated Other Costs** Similar to the undetailed investment, the audit report expressed concern with the level of unallocated costs. Bell Atlantic installed updated Bellcore software that allowed for greater retirement of unallocated other costs (under the prior release of Bellcore software, annual retirements of unallocated costs were limited to one half of one percent of the embedded base of unallocated costs). While Bell Atlantic still maintains a relatively small balance of unallocated costs, maintenance of these costs is integral to the annual reconciliation between the accounting records -- which are based on actual invoice payments -- and the engineering property records. To the extent there are differences, the addition of unallocated investment is part of the process that allows the engineering records to be brought into balance with the accounting records. Because this balance has been kept below three tenths of one percent of the asset base, it should no longer be an issue for the Commission. Bell Atlantic informed the audit staff of its intent to continue to use unallocated costs for the annual reconciliation in its May 27 response, and audit staff has not expressed any concern with Bell Atlantic's process.

**4. Physical Inventory** The audit report found that for most switching equipment (i.e. equipment purchased from AT&T), "the items are maintained in the PICs/DCPR system with an adequate description to properly locate and identify the equipment from the CPRs." Audit Report at 8. The concerns expressed in the audit report were quite specific and limited.

First, the report found that it is “difficult to locate selected plug-ins.” *Id.* But, the report acknowledged that “in recognition of this problem BA has devised an inventory method using scanners to inventory 100% of the plug-ins for a particular location.” *Id.* Bell Atlantic continues to use this scanner technology to track plug-ins today.

Second, the audit report found that the detail in the property records for switching equipment from Northern Telecom was deficient. In response, Bell Atlantic worked with Northern Telecom to increase the documentation they provide with their equipment to levels similar to that provided by AT&T (Lucent). BA May 27 Response at 5.

**5. Reconciliation of the Property Records to the Financial Records** The property records are kept separate from Bell Atlantic’s regulated financial accounting records. The latter are based on direct inputs when payments are made for capitalized goods and services. While the audit report found a significant difference in central office equipment investment between these two records, it also identified that the majority of that difference was due to a specific situation with respect to one type of equipment (see discussion of general purpose computers below). Bell Atlantic in its May 27 response recalculated the difference between the property records and the financial records by removing the incompatible data from the reconciliation report. Removing the incompatible data left a difference of \$1.8 million on a base of \$3.1 billion or six one hundredths of one percent. Regardless, Bell Atlantic implemented new procedures to assure that the two records are reconciled on a regular basis. It is important to note that in the reconciliation of the annual difference, the continuing property records are adjusted to be brought into line with the financial records, which reflect the actual costs incurred.

**6. General Purpose Computer Equipment** The audit report found that for Bell Atlantic-Pennsylvania, the description for this one category of equipment was insufficient. As explained by Bell Atlantic, when this equipment was loaded into the continuing property records system it was not detailed because “it was not possible to transfer manual records” that detailed this equipment directly into the system. BA May 27 Response at 4. This was an isolated problem limited to the Pennsylvania and Delaware subsidiaries. Since the audit, this equipment has either been detailed or retired.

### **Conclusion**

All of the concerns raised in the 1994 Audit Report were addressed by Bell Atlantic in a timely fashion. None of these concerns have resurfaced in the current audit. As a result, the prior audit cannot serve as a basis to justify any increased today.